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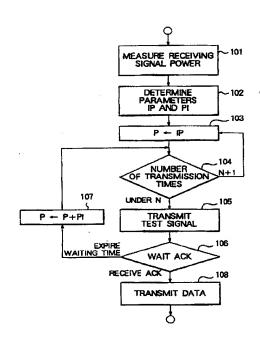
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Transmission power control method and communication device (54)

A receiving power is measured at a step 101. An initial value IP and an increment value PI for a transmission power are determined at a step 102 according to the receiving power measurement value. An expected transmission power P is set to the initial value IP at a step 103. At a step 104, it is determined whether the number of transmission times exceeds or not a predetermined number N. When the number of transmission times exceeds a predetermined number N, the operation goes back to the processing step 103. When the number of transmission times does not exceed a predetermined number of times N, a test signal is transmitted with the expected transmission power P at a step 105. After the transmission of the test signal, at a processing step 106, receipt acknowledge signal ACK from a receiving station is waited in a predetermined period of time. If no receipt acknowledge signal ACK is received in the predetermined period of time, the expected transmission power P is increased by the amount corresponding to PI at a step 107 and the operation goes back to the step 104. On the other hand, if the receipt acknowledge signal ACK is received in the predetermined period of time, the data which want to be transmitted is transmitted with the expected transmission power P at a step 108.

FIG. 3



Description

[0001] The present invention relates to a transmission in the power control method and a communication device adapted from that method. More specifically, the 5. present invention relates to a transmission power control method and a communication device for packet transmission/ or Frandom, access in communication, a devices using the Direct Sequence Code Division Multiple Access (DS-CDMA) architecture. [0002]* Random access communication systems using: DS-CDMA include those derived from the TIA/EIA/IS- and 95-A standard for use in the United States, "Mobile-Sta-section Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System", May 1995. The sys- . 15 tem set forth in this standard is herein referred to an IS- 21 95 system. For transmission of data in a random access manner, a communication device using the IS-95 system transmits the data repeatedly with increased transmission power until it receives a data acknowledge signal (ACK) from a receiving station indicating successful receipt of the transmitted data. At the time when the transmission power reaches a predetermined maximum value, the transmission power is reset to an initial value to continue transmission. The initial value for:the transmission power is determined at the transmitting station depending on received power of signals transmitted from the receiving station.

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[0003] The packet transmission supplies data in some cases as in the random access transmission. Two control systems have been proposed for the packet transmission in TRANSACTIONS OF THE IEICE, Japan 1997, pages 420 and 422. The former one is referred herein as a control system A and the latter a control system B. These systems employ different power control methods at the beginning of a transmission. The transmission power is controlled in either system according to control signals supplied from a receiving station after the second time slots of the transmission. Transmission begins with an initial value for the transmission power determined depending on the received signal power in the control system A. The receiving station supplies more control signals during the first time slot than during the second and later time slots. On the other hand, the control system B involves exchanging reservation packets between a transmitting station (sender) and a receiving station (receiver). The receiving station determines the initial transmission power of the transmitting station depending on the received signal power of the reservation packet and then notifies the transmitting station of the initial transmission power.

[0004] Conventional transmission power control methods using the above-mentioned IS-95 system transmit data several times with the power not being adjusted properly. Thus the transmission interferes significantly with other communication channel(s) that use(s) the same frequency range as the communication device in question. It is understood that the larger the transmis-

sion power the more significantly the other channel(s) is/are interfered. Reduction of the transmission power may be a solution to this problem. However, smaller, transmission power results in a longer period required for repeated transmission of data before it is received correctly. This means that the other channel(s) is/are interfered for a longer period.

As apparent from the above, once the initial [0005] value for the transmission power and an incrementing amount for the transmission power are determined, the transmission power is increased, while reset to the initial value a number of times, until the transmitting station receives the data acknowledge signal (ACK) from the receiving station. Accordingly, data are transmitted an increased number of times, interfering with other channel(s) for a longer period. Briefly, the above-mentioned prior arts have no mechanism to adjust the transmission power properly. This would be a cause of such a longer interference period. , p [0006] in In addition, the amount of interference also increases due to the repeated transmission of data. In the above-mentioned prior arts, data are transmitted at ... the increased number of times until the transmission. power becomes a proper level. The amount of interference increases as well with the increased number of " [0007] . The conventional transmission power control . , methods using the above-mentioned IS-95 system waste much power and thus dissipate a significant amount of power, sacrificing battery lifetime. The abovementioned control system A begins data transmission after an initial value for the transmission power is determined depending on the received signal power. With an ice improper initial value, other communication channel(s), c that use(s) the same frequency band range can be interfered. A grant of the [0008] The above-mentioned control system B has a problem in determining the transmission power of reservation packets. More specifically, excessively large power for reservation packets may cause interference with other communication channel(s), while reservation packets with smaller power may fail to be received by a receiving station and then they will be retransmitted. In addition, the dynamic range that is used to indicate the initial transmission power should be sufficient. [0009]: An object of the present invention is to provide a transmission power control method and a communication device that transmit no signal with improper power, eliminate: wasteful transmission, and reduce interfer-50 : ence, if any, with other communication channel(s). [0010] A transmission power control method according to the present invention comprises: measuring received power of signals transmitted from a receiving... station: determining an initial value, of transmission power according to a measurement value of the received power; and initiating transmission of a signal ... with the transmission power set to the determined initial. value. In this method, during the transmission, the

transmission power is increased until the receiving station returns a receipt acknowledge signal to the transmitting station and the transmitting station detects the receipt acknowledge signal. The initial value is decreased when the received power in the current communication is larger than that in the previous communication, while the initial value is increased when the received power in the current communication is smaller than that in the previous communication. The initial value is changed at a smaller rate in increase than in 100 decrease.

[0011] A communication device according to the present invention comprises: a receiving unit for receivable ing signals from a receiving station; a power measuring unit for measuring power of the received signals; a - 45 acknowledge signal detection unit for detecting a receipt acknowledge signal in the received signals; an initial 300 value determining unit for determining an initial value of transmission power according to the received signal power measured by the power measuring unit such that 20 the initial value is decreased when the power of received signals in the current communication is larger than that in the previous communication, while it is increased when the power of received signals in the current communication is smaller than that in the previous 25 changed at a smaller rate in increase than in decrease; and a transmitting unit that initiates transmission of data with the initial value of transmission power determined γ by the initial value determining unit, increasing gradually 1130 the transmission power until being notified of detection and of the receipt acknowledge signal. The second of the second

[0012] In the present invention, the initial value of transmission power is carefully controlled. The initial value is decreased when the received power of signals in the current communication is larger than that in the previous communication. Any interference with other communication channel(s) can thus be reduced. On the other hand, the initial value is increased when the received power of signals in the current communication is smaller than that in the previous communication. Because the increase rate of transmission power is set smaller than the decrease rate, any interference with other communication channel(s) can also be reduced.

[0013] According to the present invention, an increment value of transmission power is made larger, when
the measured value of the received signal power in the
current communication is smaller than that in the previous communication, than that when the measured value
of the received signal power in the current communication is larger than that in the previous communication.

[0014] In the present invention, the increment value of transmission power is carefully controlled. Because the initial value of transmission power in the present invention is increased in a relatively small amount, a larger number of times will be required for updating the power to a sufficient level for receiving if the increment value is the same. With this respect, the increment value is

made large when the measured value of the received signal power in the current communication is smaller than that in the previous communication. This makes possible to reduce the number of times required for updating the transmission power to a sufficient level for receiving.

[0015] According to the present invention, a test signal is transmitted until the acknowledge signal detection in unit detects a receipt acknowledge signal in response to detection of a receipt acknowledge signal, the data which want to be transmitted are transmitted with the transmission power at the time of detecting the receipt acknowledge signal.

period than the object data: This allows reduction of

any interference with other communication channel(s).

THE PROPERTY OF A WARRING COUNTY OF CONTROL FROM Fig. is a time characteristic diagram that indicates and state (of data: transmission; for use in describing): operation of a prior art; i.e. in the prior art and the same of the prior art are also as the prior are also as the prior art are also as the prior art are also as the prior are also as Fig. 2 is a block diagram of a communication device: act according: to: a : first : embodiment - of: the , present-:: invention; for the second of the control of the con Fig. 3 is a flow chart for use in describing operation. of the communication device according to the first embodiment of the present invention; and the state of the present invention; Fig. 4 is a time characteristic diagram that indicates state of data transmission for use in describing operation of the communication device according to Fig. 5 is a characteristic curve for a transmission power initial value for use in describing operation of the communication device according to the first par embodiment; zamenum un num en er Fig. 6 is a time characteristic diagram that indicates state of data transmission for use in describing operation of the communication device according to the first embodiment; Fig. 7 is a characteristic curve for a transmission power increment value for use in describing operation of the communication device according to the · first/embodiment; Fig. 8 is a time characteristic diagram that indicates. state of data transmission for use in describing to operation of the communication device according to the first embodiment; and some research and the gray is often Fig. 9 is a block diagram of a communication device ... according to a second embodiment of the present invention. . Service of the service of the security

[0017] A first embodiment of the present invention is described in detail with reference to the drawings. Referring to Fig. 2, a communication device according to an embodiment of the present invention comprises a receiving antenna 24, a demodulation circuit 23, an ACK detection circuit 25, a receiving power measure-

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circuit 16 determines a transmission power initial value cation is smaller than that in the previous communicacircuit 16 decreases the transmission power initial value munication is larger than that in the previous community of cation. The initial value determining circuit 16 determines the transmission power initial value IP such that the transmission power initial value IP is changed at a smaller rate in increase than in decrease. The incre- 125 ment value determining circuit 17 makes an increment 2002 [0020] value PI larger when the received signal power in the current communication is smaller than that in the previets: ous communication, than that when the received signal to the the previous communication: The transmission powers control circuit 15 switches transmission signals between 3 test signals and the data which want to be transmitted. ** * The transmission power control circuit 15 instructs beginning/ending of data transmission as well as the 35 transmission power to the modulation circuit 13. The modulation circuit 13 transmits, according to the instruction from the transmission power control circuit 15, the test signal with the transmission power which is: increased gradually from the transmission power initial 3,40. value IP. In response to detection of the receipt acknowledge signal ACK by the ACK detection circuit 25, the transmission power control circuit 15 instructs to transmit the object data with the transmission power at that 3 time of detection. The test signal used is a known signal that lasts for a shorter period than the object data. [0019] Next, operation of the communication device according to this embodiment is described with reference ence to Fig. 3. At a processing step 101, the receiving power measurement circuit 26 measures receivedpower of a signal transmitted from a receiving station. At a processing step 102, the initial value determining circuit 16 and the increment value determining circuit 17 determine the initial value IP and the increment value PI for the transmission power, respectively, according to / 55 the receiving power measurement value. At a processing step 103, the transmission power control circuit 15 sets expected transmission power P to the initial value

ment circuit 26, an initial value determining circuit 16, and approximately 1P/ At a processing step 104, the transmission power property increment value determining circuit 17, a transmission the control circuit 15 determines whether, the number of power control circuit 15, a timer 18, a modulation circuit as a transmission times exceeds or not as predetermined 13, and a transmission antenna 14.5% and transmission times Nas When the number tof; transmission times The receiving power measurement circuit 26 5 1 exceeds a predetermined number N, the operation goes measures power of a signal (receiving power) received 12 ... back to the processing step 103. When the number of by the demodulation circuit 23. The ACK detection circuit transmission times does not exceed a predetermined cuit 25 determines whether a receipt acknowledge sig* and thumber N, the modulation circuit;13 transmits the test nal ACK* is present for anothin and output for their the signal with the expected stransmission, power Production demodulation circuit 23. The initial value determining to (processing step 105). After the transmission of the test a company signal, at a processing step-106, the transmission of the IP according to a measurement value of the received power control circuit 15 waits for receiving the receipt signal power supplied from the receiving power measurement circuit 26. The initial value determining circuit (35) predetermined period of time that is set by the timer (187) (35) 16 increases the transmission power initial value IP . 45 . If no receipt acknowledge signal ACK is received in the . when the received signal power in the current communities appredetermined period of the at the processing step 106, the transmission power control circuit 15 increases the transmission power control circuit 15 increases the tion. On the other hand, the initial value determining are expected transmission power P by the amount corresponding to PI (processing step 107) and the operation IP when the received signal power in the current com- 20, goes back to the processing step 104. On the other hand, if the receipt acknowledge signal ACK is received in the predetermined period of time at the processing step 106, the object transmission data is transmitted with the expected transmission power P (processing, step 108). 'n, Fig. 4 is a view illustrating the transmission. power as a function of time in the data transmission by gusing the above-mentioned transmission power control. [20] The short test signals are transmitted before the transpower in the current communication is larger than that in 1930 - mission of the object data. The first test signal is transmitted with the transmission power of the initial value, IP. The transmission power control circuit 15 waits for the receipt acknowledge signal ACK for a time period of TA wafter the transmission of the test signal. If no-receipt a range acknowledge signal ACK is received in the time period of TA, the next test signal is transmitted with the trans--mission power increased by the amount corresponding to Pl. Then, the transmission power control circuit 15. waits for the receipt acknowledge signal ACK for an additional time period of TA after the transmission of the second test signal. This transmit-and-wait cycle is a. repeated with the transmission power increased gradually. In response to receiving the receipt acknowledge signal ACK, the object transmission data is transmitted with the transmission power at that time. If the transmission power is increased excessively due to no receipt s # acknowledge signal AGK is received, the transmission power is reset to the initial value IP as shown in Fig. 8. The test signal is again transmitted after the transmission power is reset to the initial value IP. [0021] The initial value IP of the transmission power is determined depending on the change in receiving power of the signal from the receiving station. Fig. 5... shows this relationship. By comparing data transmission conditions in the current communication with those. in the previous communication, the initial value deter-a. (6) mining circuit 16 decreases the initial value IP depending on the amount of increase of the receiving power

characteristic for the initial value IP obtained when the the reduction mount of the receiving power.

transmission of the test signal earlier.

[0024] As for the case shown in Fig. 6, the time dura-non-spower settings, which results in reduction of interfer- and spower settings, which results in reduction of interfertion for the test signals can be reduced by means of the frence with other communication channel(s) that use(s) that use(s) increasing the increment value PI as shown in Fig. 7, the same frequency band range as well as reduction of while decreasing the number of times to transmit the 40% the power required for the transmission. test signals@In Fig.@7, the increment value PI is set 👙 [0028] In addition, according to the present invention, - 🖘 🔒 larger when the receiving power is reduced. In Fig. 7(1) with a number of update times before the transmission and the the characteristic is expressed as a multi-stage step. It power reaches the desired value can be reduced by the characteristic is expressed as a multi-stage step. function but any other characteristics may be used as a commeans of increasing the increment value of the translong as the increment value PI is increased, when the 145 imission power when the transmission power initial value $g \in g_{1/2}$ receiving power is reduced. The Control of the Jack Control

ment where the communication device according to the present invention is applied to spread-spectrum comin comparison with the one in Fig. 2. The modulation circuit 13 in Fig. 2 is divided into three components in Fig. 9: a frame generation circuit 10, a spread circuit 11, and a radio transmission circuit 12. The demodulation circuit : 12 (12) 23 in Fig. 2 is divided into:two components in Fig. 9: a 155 . Claims 4: radio receiving circuit 22: and a despread circuit 21: The proframe generation circuit 10 arranges either the objects transmission data on the test signals with synchroniza-

when the receiving power is increased. It is noted that we tion signals and control information in time axis. The way ways the increase of the receiving power is due to reduced the spread circuit. 11 converts an input signal into a widesignal attenuation between the receiving station and the way aband signal according to spread spectrum communicatransmitting station. Communication can be made with 16.1 Ition. The de-spread circuit 21 turns the converted wide-15.1. St a smaller transmission power. When the receiving assurband signal into an original form. The radio transmission assurband signal into an original form. The radio transmission power becomes small, the initial value IP is increased a circuit 12 modulates an output of the spread circuit,11 to see the spread c by a smaller amount than the amount corresponding to the armhave a radio frequency. The radio receiving circuit 22, by any or the receiving power-reduction. The decrease of the second emodulates the received radio signal. The transmission is receiving power is considered to be due to becoming a sion control circuit 19 is a combination of the transmissignal attenuation larger between the receiving station power, control circuit, 15, the initial value, value, and the transmitting station. However, the larger trans-acceptermining circuit 16, and the incremental value determining circuit 16, and the incre mission power may interfere more and more with other to be amining circuit 17. The frame separation circuit 20 communication channel(s) that use(s) the same freed reparates the signals arranged in time axis as a parameter of the same freed reparates the signals arranged in time axis as a parameter of the same freed reparates the signals arranged in time axis as a parameter of the same freed reparates the signals arranged in time axis as a parameter of the same freed reparates the signals arranged in time axis as a parameter of the same freed reparameter of the quency band range. Thus careful operation is required in life [0026]. When the transmission data is an audio signal, the indeed to increase the transmission power. An analysis of there is no data; to be transmitted in a silent duration. The same is [0022] As shown in Fig. 5, the initial value determining of the amount of data to be transmitted is thus significant as circuit 16 does not change the initial value IP when the cantly small A modification of the present invention and the transmission power is reduced in a certain range. The " Adminiculdes such a case where the transmission of the test and a second such as the secon initial value determining circuit 16 makes the adjustment (1820) Signal is started, after enough amount of data, to be of them. value of the initial value IP smaller/than the reduction 😅 😅 "transmitted are accumulated. This configuration contribates at mount of the receiving power when the receiving power is a uites to reduction of interference with other communication of is reduced relatively significantly. An adjustment value to a bition channel(s) that use(s) the same frequency band Frange. The provide the following more than increasing their Progress. receiving power decreases may be any one of characters [0027]. As described above, according to the present and the present an teristics as long as the adjustment value is smaller than (\$25) invention, the initial value of the transmission power is, the real 35 Acontrolled depending:on:the receiving power. More spe- (r + f ≥ π) Fig. 6 is a view illustrating data transmission of power initial evalue is the extransmission power initial evalue is the extransmission of the extransmis that requires a larger transmission power as compared with a decreased when the receiving power in the current with the case shown in Fig. 4.8 As shown in Fig. 5) the was accommunication is larger than that in the previous comtransmission power initial value IP is not so increased | 30.00 munication. On the other hand, the transmission power is 10.00 munication. as the reduction of the receiving power. Therefore, the constituted value is increased when the receiving power, in the way of the test signals will be transmitted larger number of times to a construction is smaller than that in the previous security of the achieve the desired transmission power, if the incre- \$1 your communication. In this, event, the transmission is, \$100. ment value of the transmission power is the same of the same of the transmission power is the same of the such a case, that problem is solved by initiating the 35% increase than in decrease. Such control of the transmis- 35% increase than in decrease. sion power initial, value allows, proper transmission

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16 16 180 N. 184 1865 1 this increased in a relatively small amount. This also con-[0025] Fig: 9 is a block diagram showing an embodic 🚁 Itributes to the reduction of interference with other communication channel(s). The state of the stat

[0029] Furthermore, according to the present invenmunication. Now, a device shown in Fig. 9 is described: 50% tion, short test signals are transmitted before transmission of the object data ather object data is transmitted , after the transmission power is determined, reducing $g_{ij} = \gamma$ interference with other communication channel(s).

1. A transmission power control method comprising the steps of:

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measuring power of a receiving signal transmitted from a receiving station;

determining an initial value of transmission power according to a measurement value of the receiving power; and

initiating the transmission of a signal with the transmission power set to the determined initial value; wherein, during the transmission,

the transmission power is increased until a receiving station returns a receipt acknowledge signal and the transmission station detects the receipt acknowledge signal;

the initial value is decreased when the receiving power in the current communication is larger than that in the previous communication, while the initial value is increased when the receiving power in the current communication is smaller than that in the previous communication, and the initial value is changed at a smaller rate in increase than in decrease.

- 2. A transmission power control method as claimed in Claim 1, wherein an increment value of the initial transmission power is determined larger when the measurement value of the receiving power in the current communication is smaller than that in the previous communication, than when the measurement value of the receiving power in the current communication is larger than that in the previous communication.
- 3. A transmission power control method comprising the steps of:

measuring power of a receiving signal transmitted from a receiving station;

determining an initial value and an increment value of a transmission power according to a measurement value of the receiving power; setting expected transmission power as the ini-

setting expected transmission power as the initial value;

determining whether the number of transmissions exceeds or not a predetermined threshold value to return to the step of setting the expected transmission power as the initial value when the number of transmissions exceeds the predetermined threshold value; transmitting a test signal with the expected transmission power when the number of transmissions are not larger than the predetermined

waiting, for a certain period of time, a receipt acknowledge signal from the receiving station; and

threshold value:

increasing, when no receipt acknowledge signal is detected in the certain period of time, the expected transmission power by the amount corresponding to the increment value to return to the step of determining the number of transmissions, and transmitting, when the receipt acknowledge signal is detected in the certain period of time, data that want to be transmitted, with the expected transmission power.

4. A communication device comprising:

25/41/4 3 receiving means for receiving a signal transmitted from a receiving station as a receiving signal; Alaba televisional and television to the dereceiving power measurement means for measuring receiving power of the receiving signal to produce a receiving power measurement value; receipt acknowledge signal detection means for detecting a receipt acknowledge signs from an output of said receiving means; see 155 37. initial value determining means for determining an initial value of transmission power according to the receiving power measurement value; supplied from said receiving power measurement means such that said initial value determining means decreases the initial value of the transmission power when receiving power in the current communication is larger than that in 2 the previous communication, while the initial value is increased when the receiving power in the current communication is smaller than that in the previous communication, and the initial value is changed at a smaller rate, increase in the second second than in decrease; and transmitting means that initiates transmission of data with the initial value of the transmission power determined by said initial value deter-, ...mining means, and increases gradually the transmission power until said transmittingmeans is notified of detection of the receipt- acknowledge signal. --

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receiving means for receiving a signal transmitted from a receiving station as a receiving signal.

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5 Sec. 3. 16

receiving power measurement means for measuring power of the receiving signal to produce a receiving power measurement value; receipt acknowledge signal detection means for detecting a receipt acknowledge signal from an output of said receiving means;

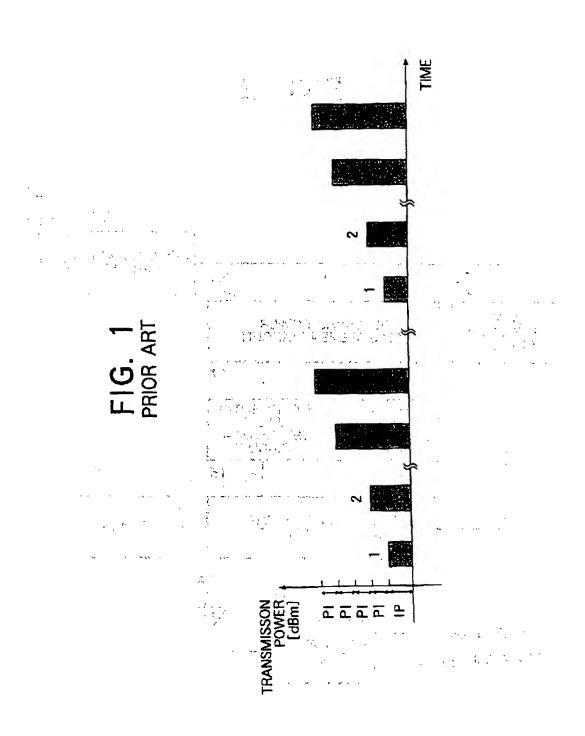
initial value determining means for determining an initial value of transmission power according to the receiving power measurement value supplied from said receiving power measurement means such that said initial value determining means decreases the initial value of the

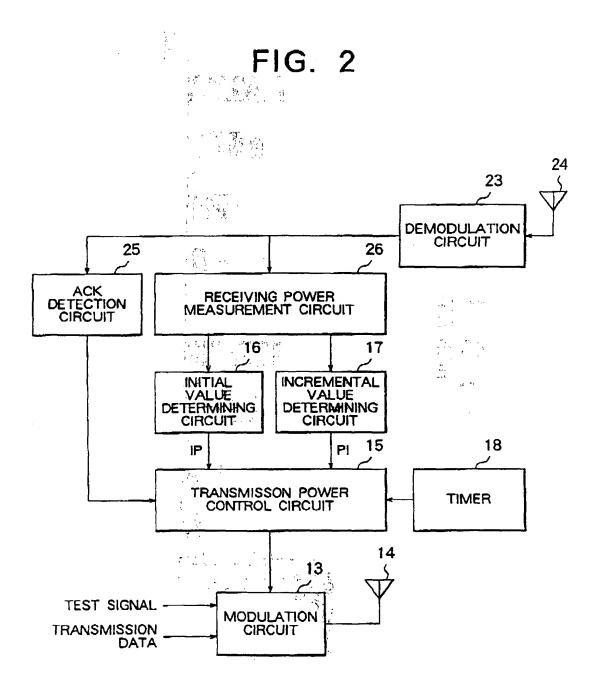
- transmission power when the receiving power min the current communication is larger than that
- in the previous communication, while the initial value is increased when the receiving power in the current communication is smaller than that 5 in the previous communication, and the initial value is changed at a smaller rate increase than in decrease; and
- Transmitting means that initiates transmission of data with the initial value of the transmission power determined by said initial value determining mans: and increases gradually the transmission power until said transmitting means is notified of detection of the receipt acknowledge signal . - - - No When I is the bound of the mile when
- 6. A communication device as claimed in Claim 4 or 5, wherein said transmitting means transmits test signal until said receipt acknowledge signal detection means detects the receipt acknowledge signal; and transmits, in response to the detection of the receipt acknowledge signal, data which want to be transmitted with the transmission power at the time of the detection. The same of the ne terreta con articoloxida e ambi comercia de
- 7. A communication device as claimed in Claim 6, wherein said transmitting means begins transmission of the test signal at an earlier timing when the initial value of the transmission power is increased. CALL OF THE STATE OF THE STATE OF Liebs Fore di
- A communication device as claimed in Claim 6 or 7, wherein an increment value of the transmission power used by said transmitting means is determined according to the receiving power measurement value supplied from said receiving power measurement means, and wherein said communication device further comprises increment value determining means for determining a larger-increment value when the receiving power in the current communication is smaller than that in the previous communication, than when the receiving power; in the current communication is larger than that in the previous communication.
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FIG. 3

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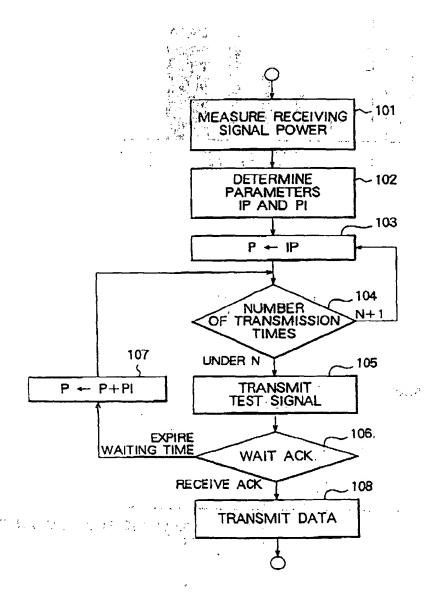


FIG. 4

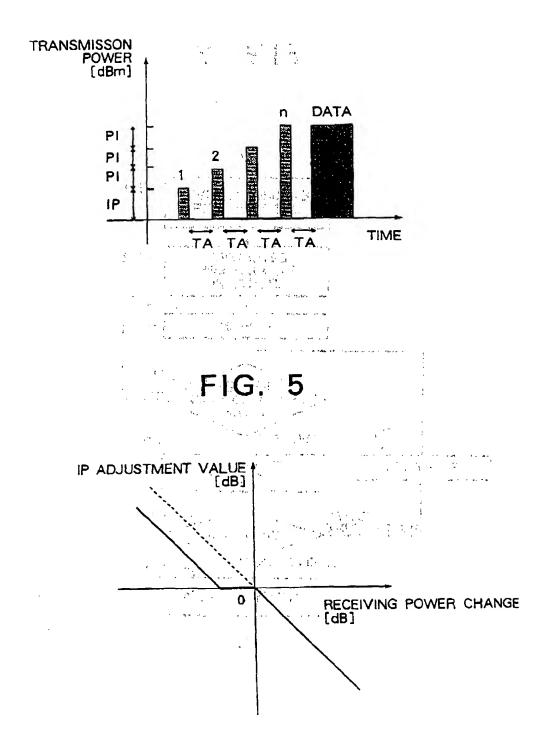
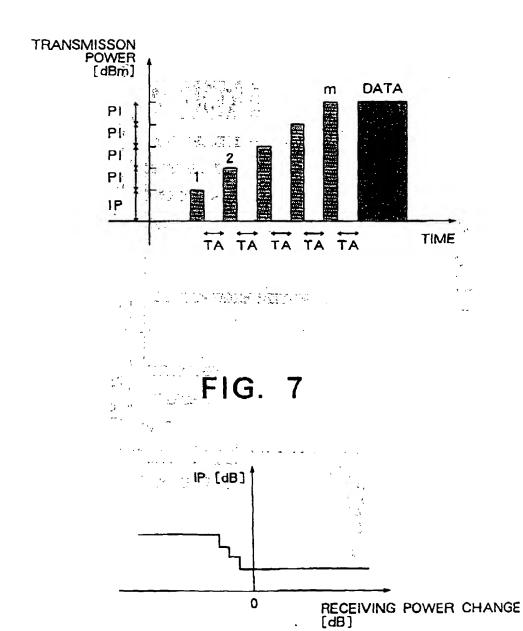


FIG. 6



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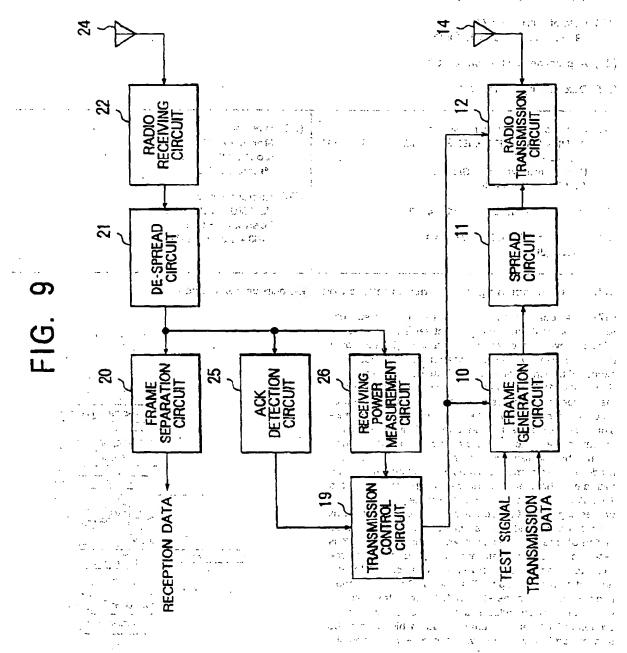
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(12)

EUROPEAN PATENT APPLICATION

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(71) Applicant: NEC CORPORATION Tokyo (JP)

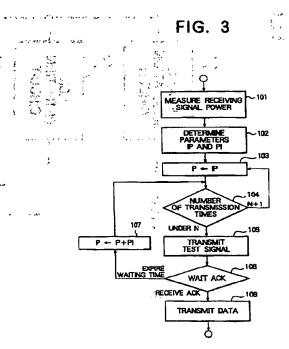
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(54) Transmission power control method and communication device

A receiving power is measured at a step 101. An initial value IP and an increment value PI for a trans--mission power are determined at a step 102 according to the receiving power measurement value. An expected transmission power P is set to the initial value, IP at a step 103. At a step 104, it is determined whether the number of transmission times exceeds or not a predetermined number N. When the number of transmission times exceeds a predetermined number N, the operation goes back to the processing step, 103. When the number of transmission times does not exceed a predetermined number of times N, a test signal is transmitted with the expected transmission power P at a step 105. After the transmission of the test signal, at a processing step 106, receipt acknowledge signal ACK from a receiving station is waited in a predetermined period of time. If no receipt acknowledge signal ACK is received in the predetermined period of time, the expected transmission power P is increased by the amount corresponding to PI at a step 107 and the operation goes back to the step 104. On the other hand, if the receipt acknowledge signal ACK is received in the predetermined period of time, the data which want to be transmitted is transmitted with the expected transmission power P at a step 108.



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EUROPEAN SEARCH REPORT EP 98 12 1538

ategory	Citation of document with in of relevant pass	idication, where appropriate, ages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CL5)
	AL) 18 March 1997 (DGRASS CHARLES K ET 1997-03-18)		H04B7/005
•	* abstract * * column 1, line 50 * column 2, line 17 * claim 1; figures	- column 3, line 6 *		
	+ Craim'i, rigures		7 1	
:	27 December 1991 (1 * abstract *		1,3-5	
:	Ticorumn 5, Time 11	-: column 4, line 1 *		
	EP'0 565 507 A (ERI COMMUNICAT) 13 Octo *:abstract *	ber 1993 (1993-10-13)	1,3-5	
1	* page 3, line 10 - * page 6, line 34 - * figure 2 *	line 33 * 1		
:	9.	50 But 18		
	7 3 1 L			TECHNICAL FIELDS SEARCHED (Int.CI.6)
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	THE HAGUE	5 December 2000	Lol	pez Márquez, T
X : par Y : par	CATEGORY OF CITED DOCUMENTS micularly relevant if taken alone rticularly relevant if combined with and current of the same category	E : earlier paternt of after the filing of ther D : document cites	ocument, but put ate	ofished on, or

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

"EP 98 12 1538

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.

The members are as contained in the European Patent Office EDP file on the European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

	1 5 5 5	1 62.25		er er zaar ar ee
Patent document cited in search report	Publication date	17.	Patent family member(s)	Publication date
US 5613228 A	18-03-1997	US	6101375 A	08-08-2000
		a er a US i	5778309 A	07-07-1998
EP 0462952 A	27-12-1991	SE	467332 B	29-06-1992
LI 0402332 A	27 12-1991		121242 T	15-04-1995
•		AU	635429 B	18-03-1993
•	1	AU	7917391 A	02-01-1992
•			9102499 A	21-01-1992
1		CA	2045211 A	22-12-1991
!			1057557 A; B	01-01-1992
:	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	DE	69108793 D 69108793 T	18÷05÷1995 24-08-1995
•	\$ · · · · · · · · · · · · · · · · · · ·	DK	462952 T	14-08-1995
•	•	ES	2073728 T	16-08-1995
	3	HK	108795 A	14-07-1995
i		JP	4233334 · A	21-08-1992
The state of the s	,	KR	9606142 B	09-05-1996
		NZ	238269 A	26-10-1993
e e e e e e e e e e e e e e e e e e e	;	SE US	9002228 A 5241690 A	22-12-1991 31-08-1993
				31-00-1993
EP 0565507 A	13-10-1993	AU	4280693 A	18-11-1993
!		BR	9305478 A	11-10-1994
•		CA	2111000 A	28-10-1993
		FI JP	935525 A 8502151 T	17-01-1994
1		KR	210632 B	05-03-1996 15-07-1999
•		NZ	252801 A	25-09-1996
· •	1	SG	50659 A	20-07-1998
		WO	9321692 A	28-10-1993
•	•	US	5430760 A	04-07-1995
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For more details about this annex :see Official Journal of the European Patent Office, No. 12/82



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